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The Northwestern MILLER

MILLING PRODUCTION SECTION

IONIZING RADIATION EXPERIMENTS

Can They Be Used on Grain and Grain Products?

EDITOR'S NOTE: The following article was delivered to the German Cereal Chemists Congress in Detmold recently by Professor Dr. Ing J. Kuprianoff, a European scientist. It is reprinted from Milling, the British trade journal.

Before we deal with the question of the possibility of using ionizing radiations on grain and grain products, we should consider, very briefly, by way of an introduction to the problems ahead, the types of radiation that come into the discussion, and their effect. We are confining our interest here to those radiations or radiation types that can be technically produced and have a biological effect. The point to note about them is that this effect—when it occurs—is caused by extraordinarily small amounts of energy: It follows from this that the use of such rays is not attended by any noticeable heating, although major effects may be produced in the irradiated stock. Thus, the ionizing radiations may be of particular importance above all for stocks that are sensitive to temperature.

As far as the question that we are dealing with here is concerned, we are interested in two types of radiation:

1. The so-called electro-magnetic radiations, to which belong the infrared rays, visible light, ultra-violet light, X-rays and gamma rays. They differ from each other solely by reason of their wavelength; the shorter the wavelength of the rays the higher is their frequency and the more penetrating and rich in energy they are. The most penetrating are the gamma rays.

Of the electro-magnetic radiations we are interested in this case in those with an ionizing effect—the X and gamma rays. They may be produced by means of special apparatus such as the X-ray machine. Their energy, which determines their penetrating power and their effects, is calculated according to the voltage of the current used to produce them. There are also radioactive substances (radioactive isotopes, radionuclei) that emit gamma rays of a given energy content; these substances may also be used as sources of radiation. Significant differences between the two types of radiation source stem from the fact that radiations produced by machines may be interrupted by turning off the electric current supply and that the X-rays produced normally represent a polychromatic mixture of radiations; the percentage of the hardest radiations in the spectrum is always relatively low. Radionuclei, on the other hand, give off uninterrupted radiations, diminish in their activity with time according to an exponential law, and deliver chiefly monochromatic or bichromatic radiations.

2. In the second type of radiation we have to do with a stream of electrically charged particles—that is, a corpuscular radiation. The rays are known as electron or beta rays. Their penetrating power and effectiveness are likewise dependent on their energy. This energy is expressed in electron volts, and corresponds to the tension which is used to accelerate the electrons in the appropriate machines—the so-called electron accelerators. We find, too, among the radioactive substances some that emit beta-rays and may thus be used as sources of electron radiation.

These two different types of radiation—the energy-rich electromagnetic rays and the electron rays—have a great deal in common. They are both capable of ionizing particles of matter that they strike. It is on this fact that a large part of their effect depends, because the ionized particles are known to be particularly chemically reactive. It is further apparent that under equivalent irradiations the biological and chemical effects of both types of radiation are identical. To achieve equivalence of irradiation it is merely necessary that each volumetric unit of a given material should have the same "radiation dose" directed at it. We measure the radiation dose in watt/hours (Wh) and relate this amount of energy to one kilogram of the material to be irradiated.

There are, of course, considerable differences between the two types of radiation, and they can be of great importance to us, particularly as they affect the penetrating power and the degree of effectiveness of rays produced in the appropriate apparatus. It is apparent that the penetrating power of electron rays at the same energy or produced by the same tension is only a fraction —approximately one half or as little or one fifth—of the penetrating power of X or gamma rays. For each million electron volts the electrons can penetrate only five millimetres into material of the density of water. It is possible, however, to produce beta rays rather more effective than this. Satisfactory electron accelerators for high radiation doses can be built at acceptable prices, although the thickness of the foodstuff masses on which they can be used will probably have to be limited to between two and four inches.

A knowledge of the effectiveness of the rays should enable us to build a comprehensive set of directions for their proper use. The effects of radiation are very complicated, however, and some of the individual ones are not yet known or even perceptible. This is particularly true of the effects of radiation on complex systems such as those represented by biological forms, to which the coarse grain and grain products belong. We must therefore be satisfied in many cases with summarily establishing the total observable effects of radiation. As an example of such a summary observation we can take the well known fact that the smaller the organism the higher is the radiation dose required to kill it. We know, for instance, that to kill a man or one of the higher animals requires less than one thousandth of the dose needed to kill a microbe spore. The average lethal radiation dose for a human being, therefore, requires a total amount of energy of only 0.1 to 0.2 Wh.

The total effects of radiation are practically divided into four groups, physical, chemical, biochemical and biological. We shall now consider them individually:

1. The direct physical effects of radiation consist in the first place of ionization of the component parts of the irradiated substance, together with activation of the individual molecules struck by the rays. Their reactivity is thereby heightened. The increase in temperature is slight, since the total amount of energy directed onto a substance during irradiation is very small. Finally, the use of appropriate high-energy radiations of more than 15 or 20 million electron volts can lead to radioactivity. However, this is practically never the case. The energy of the beta and gamma rays of radioactive isotopes is much too low to induce artificial radioactivity in the irradiated substance. In apparatus for producing radiations the radiation energy of 15 million electron volts required to induce radioactivity is not produced for economic reasons. Tests have shown, however, that radioactivity thus artificially induced in foodstuffs generally dies quite quickly. Thus in irradiation by means of isotopes or radiation-producing apparatus the danger of an eventual emergence of radioactivity is in practice excluded.

We should note, however, that this is not true in the case of the by-products of nuclear reactors; they emit neutrons that would induce artificial radioactivity in foodstuffs.

2. The chemical effects that take place under radiation are extraordinarily complicated. Since they are usually undesired—for example in sterilization — they are designated "side effects." They can be divided basically into those that are primarily produced by the direct effects of radiation (e.g. the deaminization of amino acids) and those that are secondarily produced by the indirect effects of radiation (e.g. oxydization by free radicals produced by irradiation). The second type of reac-

(Continued on page 8a)

DISTRICT CHAIRMAN—International officers and fellow committeemen congratulate Frank A. Lindholm, King Midas Flour Mills, on his appointment as chairman of AOM's District No. 4 in Minneapolis. Left to right are Carl Gottschalk, Atkinson Milling Co., committeeman; Mr. Lindholm; Donald S. Eber, international secretary; William P. Riley, William Kelly Milling Co., international president, and Marvin R. Shaw, Bay State Milling Co., committeeman.

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Camera Views of AOM Technical Committee Meetings . . .

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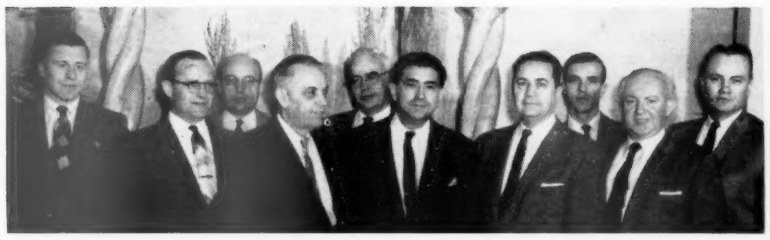
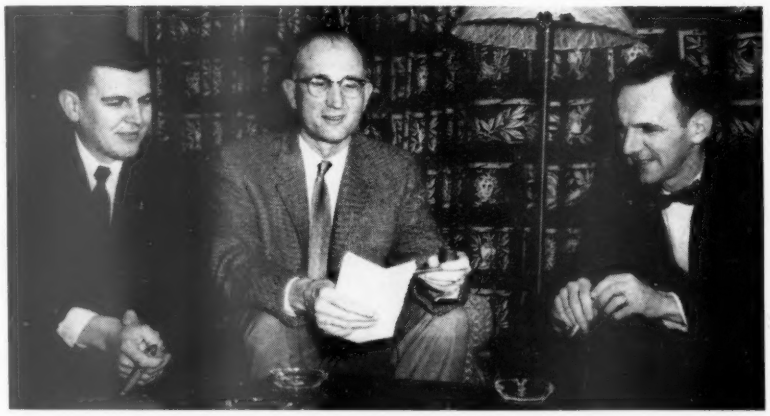


TECHNICAL COMMITTEE—This, the largest AOM committee, attracts full attendances at its meetings and members continue investigational work through a series of subcommittees. Pictured are some of the committee members when they met in Minneapolis recently. Left to right, David Mattson, Atkinson Milling Co.; Alden A. Ackels, General Mills, Inc.; Eugene E. Woolley, GMI; Dewey Robbins, Fisher Flouring Mills Co.; Lyle Mertz, GMI; Tibor Rozsa, Pillsbury Mills, Inc., chairman of the committee; L. E. Collier, National Milling Co., Toledo; John Wingfield, Colorado Milling and Elevator Co., Denver; Eugene J. Gehrig, Quaker Oats Co., and W. Francis Rowe, Pillsbury Mills, Inc.

SANITATION

SANITATION COMMITTEE—Members of the AOM Sanitation Committee pictured during their recent meeting in Minneapolis. Seated, left to right, are Dr. Richard T. Cotton, U.S. Department of Agriculture; George Wagner, Pillsbury Mills, Inc., chairman, and Harold Goossens, Russell-Miller Milling Co. Standing at the back, left to right, are Prof. Donald Wilbur, Department of Entomology, Kansas State College; Paul McSpadden, Archer-Daniels-Midland Co., and Waldo Locke, General Mills, Inc.

EDUCATION



AOM EDUCATIONAL COMMITTEE—Three members of the educational committee pictured in discussions at Minneapolis. Left to right, Arthur N. Hibbs, International Milling Co.; Prof. Eugene P. Farrell, Kansas State College, committee chairman, and Stephen J. Loska, Jr., Pillsbury Mills, Inc.

SPECIAL AWARD

SERVICE AWARD—William P. Riley, William Kelly Milling Co., Hutchinson, Kansas, international president of the Association of Operative Millers, left, presents a service award to Richard C. Bradford, Pillsbury Mills, Inc., retiring chairman of District No. 4, AOM, during a meeting of the district in Minneapolis Jan. 19. Mr. Bradford, who was succeeded by Frank Lindholm, King Midas Flour Mills, was elected national committeeman of the district.

Conference Committee

Association of Operative Millers
61st Annual Technical Conference—A.O.M.

Statler Hotel, Buffalo, New York, April 28 to May 2, 1957

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Three Forces Turn Industry Towards Solving Its Sanitation Problems

Three forces, competition for the consumer dollar, compliance with regulations and competition for personnel, contributed mightily to turning industry towards solving its sanitation problems, Glenn O. Munger, Industrial Fumigant Co., Kansas City, says in describing the growth of sanitation research in a service letter for his company.

These forces exerted pressure long before they became apparent to most people, Mr. Munger relates. As the effect of progressive thinking toward sanitation became better known, and as more and more people began to think alike on mutual problems of food plant sanitation, the wheels began to turn.

The U.S. Department of Agriculture began an intensive research program on the control of insects in stored grain. Other projects included work on insect control in flour and cereal mills; general fumigation; control of insects in the field, in commodities and in transit; and many related programs. All of this effort was directed at finding the best and most practical way to control insects all along the line from field to consumer.

The research program began to turn up answers that provided both solutions to particular problems and developed new points for consideration and study. Thus, research problems began to increase in size and number, and this meant more people were needed to carry on the work. As a result, more individuals turned their attention to this field and moved into staff work. Colleges and universities throughout the country entered into the program through research of their own, while training men in such fields as entomology, chemistry, biology and related fields in order to supply workers for the research programs.

Industry was not unaware of the stirring and rumblings beginning to be heard throughout the country and even around the world. Management began to look into the programs that were under way to see what the future held. Long range thinking and calculated foresight at the management level began to have its effect on this growing field of endeavor.

Study Not New

But study in the field of insect control isn't entirely new. Research directed toward grain pests and their control has been going on for many years. One finds references throughout ancient literature indicating that man was aware that he was not the only claimant to the food he raised himself. Flour beetles have been found in grain buried with the ancient Pharaohs in their tombs more than 3,000 years ago. Research has been carried on all of these years in an effort to protect man's food for his own use. Some of the efforts were crude at their best, but others were excellent if one considers the time when they were carried on and the tools available to the workers. As time went on, more knowledge became available and more advances were made. The only drawback was that this information was scattered and had not been brought together, and the pieces fitted in with each other.

Gradually, however, the bits of information were pieced together and greater understanding of the problems resulted. As understanding increased, more problems were solved and new fields opened to experimenters. This progress began to snowball and to develop into the concentrated investigations mentioned above. Coordinated research programs were started, and out of each study came a host of new concepts, methods and ideas. Each new facet was taken under study, and the pattern repeated.

An example of the way the research programs mushroomed can be drawn from the efforts to investigate and evaluate grain fumigation. A program was started to evaluate and develop fumigant mixtures. While this was under way, problems of surface infestation came up; and this phase became a project in itself. At the same time, distribution habits of the insects and their life history, studies on insect ecology were started. Effects of various chemicals on the grain itself were determined, and tests relating to other storage problems were conducted and evaluated. Follow-up ideas on this work were such things as bin sprays, grain protectants, problems in transportation, rodent control, studies of micro-organisms in grain, application methods for chemicals, application equipment and a host of others.

Gradually, information was accu-

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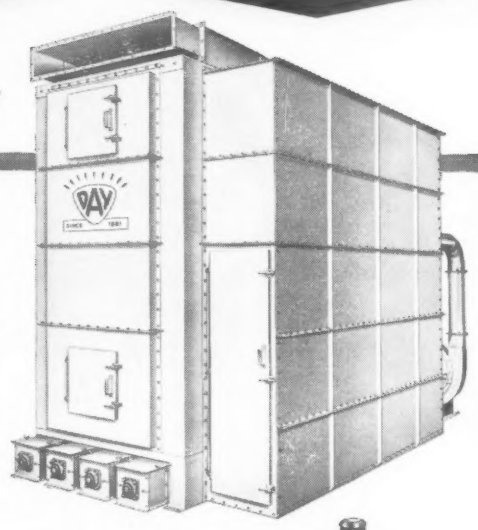

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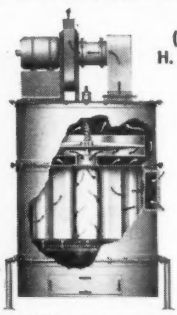

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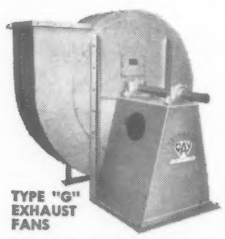

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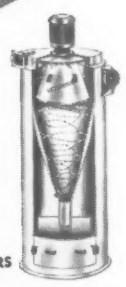

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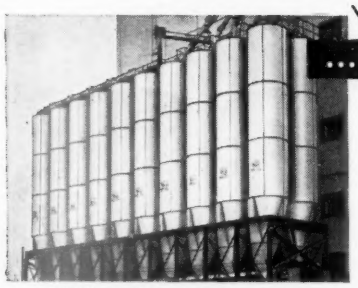

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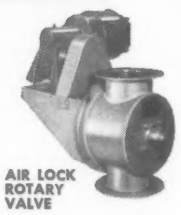

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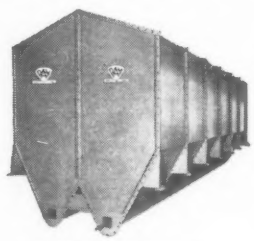

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Ray P. Millard

Dawson & Associates Promote Ray Millard

J. Carl Dawson & Associates, St. Louis, preventive sanitation consultants, have announced the elevation of Ray P. Millard to the position of executive director.

Mr. Millard is a graduate in entomology from Kansas State College, Manhattan, and was employed in the USDA Stored Products Insects Laboratory at Manhattan prior to joining Dawson & Associates in 1949. Mr. Millard is a member of the Association of Food Industry Sanitarians and the Entomological Society of America. Since 1949 he has continuously served as a preventive sanitation consultant, and he has had opportunities to become intimately acquainted with the detailed sanitation problems of a wide variety of food processing plants.

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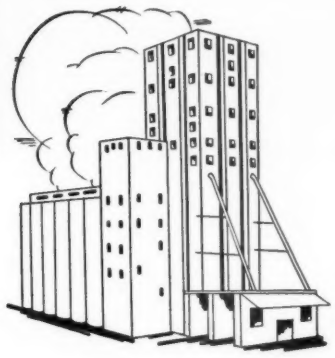
mulated, and not only did USDA and colleges become more interested, but also managment of the food industry became deeply concerned. Investigations were started by the food industry to work out their own current problems as well as others which came up as work progressed. Various parts of the industry saw what others were doing and accomplishing so they, too, began to work on their own special problems. Principles were established for one type of industry, and others could use these principles and adapt them to their own use. The turn to increased research by industry exerted the same expanding force on the program that early research had brought about.

Technical People Appear

Industry brought research problems into the plant and the laboratory and into management circles, while also giving money to institutions for further study. Technical people began to appear on the staffs of the food producing concerns. These people were equipped to work in the field of sanitation and to conduct research problems within a given organization. Management backing was necessary, and support was not lacking.

Studies that had their origin in the early concentrated program were expanded and reevaluated. The investigation of insects moved into the plant, and they were studied as they were found under these conditions. The chemicals were tested and evaluated under all conditions and in all locations in the plant. Housekeeping methods were studied and improved. The transportation methods, storage methods, and product and quality control procedures all were reexamined with an eye to clues for possible improvements in sanitation methods. The laboratory went to work on a program to discover ways to check product contamination, to develop methods of determining where contamination had originated and to work out continual systems of product quality control directed toward sanitation problems.

Management of the food industry followed closely the programs in outside agencies and in their own industry. New developments began to come along with a regularity that changed many things in the way food is manufactured. Studies of insect habits and methods of control in food plants began to exert an influence on the design of machinery as a means of providing better conditions for the food manufacturer and discouraging insect infestation. Not only was existing machinery modified and redesigned, but also new machines were developed to cope with insect problems. As these machines were installed, additional uses were found for them in the manufacturing processes. Even materials long used in machinery manufacture underwent improvement and change. Wood, for example, gave way to stainless steel and aluminum. Materials such as neoprene, plexiglas, polyethylene and other plastics came into wide use for specialized purposes in sanitation. Thus, management concern with sanitation problems and their solution was expressed in the engineering



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Engineering efforts went still further, in that sanitation became a part of plant design. The period following World War II saw much done in the way of new buildings and remodeling of existing structures for food production. Sanitation was considered by all concerned with the projects and many desirable features from the sanitation viewpoint were corporated into the structures. Along with building design, the production processes were altered and modified to provide better conditions for clean food production.

The inclusion of good sanitation methods in the thinking of designers and production people had a two way effect. The sanitation problems were solved in most cases, or at least, vastly improved. And in most cases, a machine, process, or building design, after being modified toward sanitation, performed much more efficiently, resulting in improved production and quality. The work in sanitation had, indeed, progressed into areas that few thought would be affected.

The interest in food plant sanitation and the stimulation to further work was also responsible, in part, for the stepped up activity in enforcement of federal and state regulations governing food production and marketing practices. When preliminary research programs were underway, they were followed by an increased effort toward enforcement. At this point, management saw that, through the stimulation of research and added emphasis on the sanitation program, the food industry could comply with regulations. Then, as management thinking was projected into the years ahead, the advantages of sanitation advances became clear.

Through the sanitation program and research to make more information available, existing conditions could be corrected and a coordinated program designed to prevent these conditions from recurring was within reach. The emphasis on enforcement of regulations gave a tremendous boost to the advance of sanitation in the food industry. With the background already operating in the form of research programs, the food industry had a solid footing on which to base its efforts to improve conditions that were below standard.

Provided with the incentive to make even more progress through the research and enforcement programs, management expanded its quest for knowledge. Where different types of food producers had formerly just watched the progress of others and then started programs of their own, they now began to disseminate information through various organizations.

Information Exchanged

Trade organizations began to work to inform their membership of the progress and developments through meetings and publications. Committees were formed within the organizations whose sole function was sanitation. Cooperative projects were started within the membership and outside agencies were encouraged in new projects. Work began on a plan to accumulate all pertinent information and recommendations into manuals or permanent reference works for the benefit of all concerned. Sanitation was unique in this realm of activity in that few secrets were kept. The cooperative effort between firms was tremendous and information flowed both ways, generally through the channels of the organizations and their committees.

Management representatives and representatives of the trade organizations also met and worked closely with the government agencies concerned with sanitation. Cooperation between government and industry in working out mutual problems has been, and still is, highly successful. The cooperative research programs within the food industry between various governmental agencies and interested allied firms have accomplished many things and much progress has been made.

The various magazines and trade journals perform a valuable service to sanitation by bringing accounts of new developments to their readers. Much valuable information has been published and, in this way, data has been collected and inserted into the proper niche to give a clearer picture of the over-all program.

All of these groups, working together, have brought about the sanitation programs as they are today. Very rarely has a group so large and so diversified as the food industry banded together so closely and accomplished so much. This action is unique and workers in the field are proud of the way their co-workers, companies, institutions and agencies have performed and are gratified by the accomplishments that have been made.

—BREAD IS THE STAFF OF LIFE—

NAMED A DIRECTOR

NEW YORK—Paul Neils, president of the J. Neils Lumber Co., which recently became a division of St. Regis Paper Co., has been elected a director of St. Regis to fill a vacancy created by the resignation of Thomas H. Cosford. Mr. Cosford was managing director of St. Regis' Canadian subsidiary until his retirement under terms of the company's pension plan in July of 1954.

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Fumigant Behavior In Stored Grain Being Studied

Fumigants vary not only in toxicity to insects but also in the degree to which they can penetrate to the bottom of a pile of grain.

Among those currently engaged in analytical studies of fumigant behavior in stored products, such as grain and flour, is B. Berck, chemist with the Stored Product Insect Laboratory, Science Service, Canadian Department of Agriculture, at Winnipeg, Man. He has shown that fumigants consisting of mixtures of two or more chemicals behave differently in stored grain, depending on the chemical composition of the mixture.

For example, Mr. Berck's studies reveal that considerably greater amounts of the fumigant, ethylene dibromide, penetrate to the bottom of a grain pile when it is mixed with two other fumigants, ethylene dichloride and carbon tetrachloride, than when used alone or when mixed with methyl bromide. This deeper penetration also results in improved toxicity or poisoning effect on the insects.

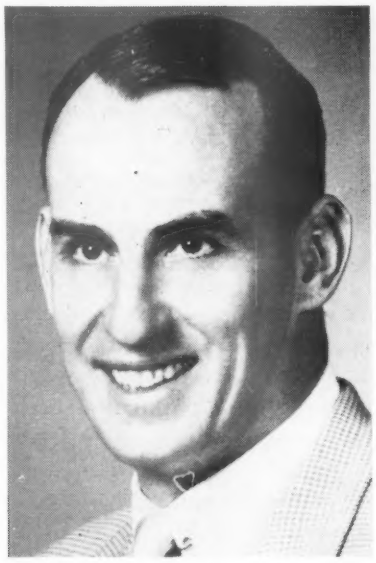
While differences in the penetration characteristics of single fumigants had previously been indicated in tests on fumigants, Mr. Berck's studies represent the first time that the distribution patterns for these fumigant mixtures have been evaluated chemically. Factors that affect downward penetration of fumigants through grain are moisture content and temperature of the grain, the amount of weed seeds of high oil content, and the nature and amount of fumigant applied.

Fumigants are chemicals that yield toxic gases or vapors. These chemicals offer the only practical means of control for insect infestations at sub-surface levels in a pile of grain, in holds of ships, in bales of wool, beneath floor boards or in crevices of buildings. If gases can be adequately confined, fumigation is at present the cheapest and quickest method of controlling insects, rodents and soil micro-organisms. When places harboring such pests are inaccessible, it is useless to apply stomach or contact poisons, although "attractants" may entice pests onto poisoned surfaces.

A good fumigant must meet several requirements. It should penetrate the material in question to the site of infestation and should remain there as a gas in adequate and uniform concentration for an adequate period of time. It should be chemically stable under the particular conditions of storage and application and should not impair the quality of the commodity as to appearance, texture, odor, handling qualities, germination capacity and nutritive value. It should not leave a residue that is poisonous to humans, domestic animals or growing plants. Finally, the cost of treatment should be less than the value of the commodity saved from insects.

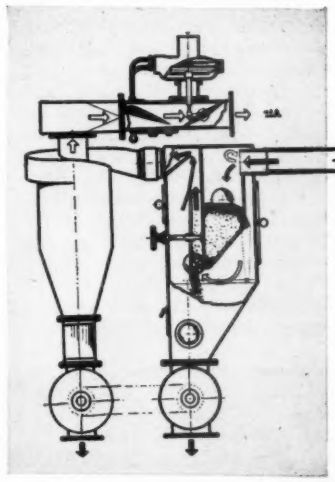
Scientists are unlikely ever to devise the perfect insecticide, mainly because of the large number of insect species and the amazing variety of their environments. It should be noted that a given fumigant is not equally and invariably effective in the control of all insect species, in all stages of development, in all circumstances.

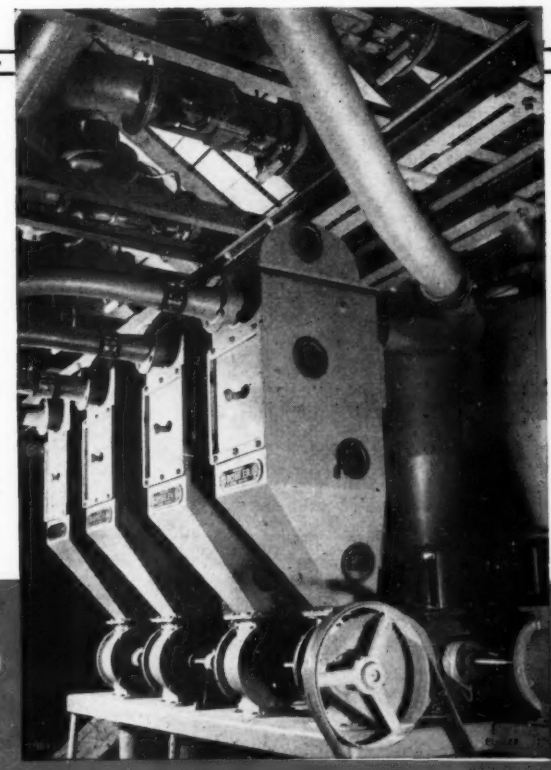
Fumigants are valuable tools in the chemical control of economic pests. Although there is still a great deal to learn, scientists are beginning to understand a little better how these chemicals work, the factors that influence their action and also some of their limitations.



James V. Mayhall

MANAGER—James V. Mayhall has been named general manager of the newly organized feeds division of the McCabe Co., Minneapolis. Mr. Mayhall served the past five years as general manager of the Dover (Ohio) Milling Co. His previous five years were spent as vice president in charge of production and sales for Union National Mill, Springfield, Ohio. He is a 1946 graduate of Ohio State University, where he majored in industrial management. McCabe operates 62 elevators in Minnesota, North and South Dakota and Montana.





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Moreover, in Buhler pneumatic systems, the air conveys and also aspirates the discharged grain, removing light impurities such as dust and straw and reducing the risk of infestation. Additional aspiration takes place on each vertical lift.

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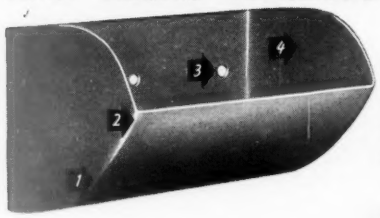

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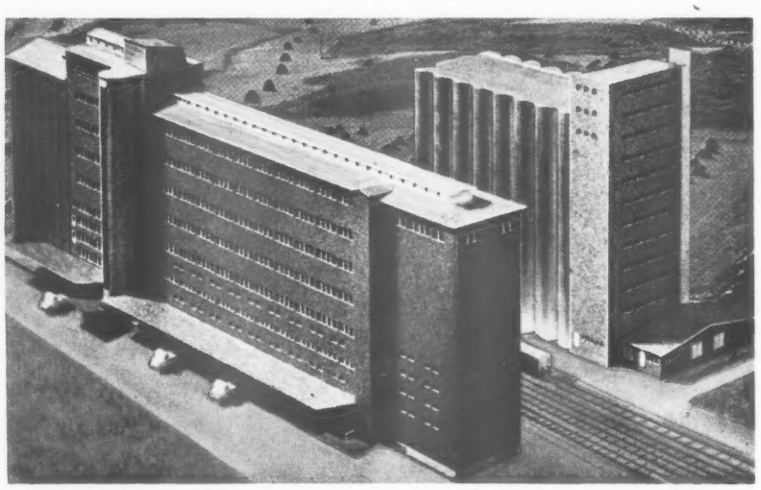
RADIATION EXPERIMENTS

(Continued from page 1a)

tion is preponderant in most foodstuffs, apart from those with very low moisture contents, on account of the very high percentage of water that is usually contained in food products, so that secondary effects have a decisive share of responsibility for radiation damage. In foodstuffs we are concerned chiefly with reactions caused as a result of oxydization through newly formed hydroxyl (OH) radicals or through reduction by built up hydrogen atoms. These undesired reactions cover only something like 0.003% of the available chemical combinations, quantitatively speaking, but they give rise to products that are perceptible by the senses and show themselves in changes of color, consistency, smell and taste. From the point of view of health, too, they cannot be considered unobjectionable. Since they appear often in exceptionally small quantities they are mostly impossible to lay hold of analytically. Side effects occur in different foodstuffs at quite different dosages, so that the establishment of a universally valid rule is not possible (see table). Basically, the side effects are reduced with diminishing dosages, and there is often found to be an increasing value for the dose, at which no organoleptic changes are detectable. The use of high doses, however, is often forbidden by the undesired side effects that they will call forth. These side effects can be reduced by lowering the temperature at which the product is irradiated (e.g. by freezing it), by removing the oxygen (e.g. by evacuating it), by reducing the moisture content (e.g. by drying it), by the use of antioxydants (e.g. ascorbic acid), and so on. If the side effects are thus repressed, the effect that the irradiation is intended is often also weakened.

After irradiation is completed the reaction products that have appeared will continue to subsist or to produce new secondary products. In individual cases, therefore, we may speak of "after effects" of radiation. They may, for example, consist of the irradiated product's retaining



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(Top) A model of the fine new O.T.K. mill at Hameenlinna, Finland, erected under the capable supervision of Mr. F. G. Boon (above) known to millers the world over as Robinson's chief erector.

Robinson mills are going up in every corner of the world under the experienced eyes of Robinson erectors. These specialists supervise progress from the placing of the first machine to the completion of the new start up and they can be joined "on the spot" within hours by Robinson milling and pneumatic engineers from Rochdale. The world is a small place by air—and the Robinson world-wide service means what it says.

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A. K. Martinson

PROMOTED—A. K. Martinson has been promoted to sales engineer with the Strong-Scott Manufacturing Co., Minneapolis. He has been on the company's sales service staff in Minneapolis for the past year. Mr. Martinson will serve eastern and southern Wisconsin and northern Illinois territories for the grain processing equipment division. He is a native of Iowa, and attended Drake University, Des Moines. He was formerly a millwright with the Geo. Todd Construction Co.

bacteriostatic characteristics for some time and thus remaining capable, even after the end of irradiation, of inhibiting microbe growth and thus the possibility of microbial damage.

3. The biochemical effect of ionizing radiations consists, with the use of appropriate doses, of more or less comprehensively inactivating the enzyme systems or even of destroying them. The doses required for complete inactivation of enzymes are, however, very high.

A table to show the maximum reliable dose that can be given without the appearance of undesired organoleptic changes. The figures were established by American experience with the irradiation of various foodstuffs.

Foodstuff	Maximum dose in Wh/kilo
Apple pulp	5
Apple juice	2.5
Bananas (whole)	0.4
Beans, runner (green)	4.
Beans, Lima	0.1
Endive	0.1
Peas	2.
Strawberries	1.2
Grapefruit	1.2
Cheese	0.2
Flour	1.2
Milk	less than 0.2
Oranges	less than 1.2
Orange juice	less than 0.4
Plums	less than 1.
Prunes	more than 7
Tomatoes (whole)	5
Raisins	more than 5
Tomato juice	0.6
Lemon juice	0.2

4. The biological effects of radiation are undoubtedly the most complex, the most difficult to survey, and the most closely connected with the other effects of all the manifestations of the power of radiation. They cover almost all life forms of plant and animal organisms, and may consist of changes in hereditary characteristics caused by damage to genes, cutting out or strengthening mutations; of influencing the metabolism of living organisms, and even of extinguishing life itself. It is living creatures above all that are especially sensitive to radiation. The bigger they are, and the more complex their structure, the more sensitive they are. Since man in particular is so much more liable to damage than bacteria — between 1,000 and 2,000 times more liable—particular care should be taken about all the requisite precautions to protect him against the undesired effects that can lead to such great damage.

In individual cases we can use the microbe-killing effect of radiation, according to the dose, to produce complete or partial sterilization. We can thus sterilize—for which a dose of 5 Wh/kilo would be needed—as well as pasteurize, and we can do this by selecting the type and controlling the energy of the radiation or by irradiating the surface only or deep into the interior of the product, according to its dimensions.

Use, Safety, Packaging

Whether we wish to irradiate products for sterilization or only pasteurization, they must be protected against renewed infection from outside before they will keep. It is thereby necessary that they be suitably packed before irradiation. Since the penetrability by radiation of the various packaging materials depends on their specific weight, and since it is greater as the material is lighter, it follows that wherever possible packing materials of low specific weight will be chosen. The different types of synthetic sheet are very suitable for the purpose—for example those of polyethylene, celloglass and similar types. When highly penetrative gamma rays are used, however, it is possible to use tinplate as a packing material.

If we examine the different possibilities of using ionizing radiations for the treatment of foodstuffs, we can establish on the basis of the available evidence that among others

● At the check-out counter of a supermarket, a member of a research team asked a lady if she'd mind answering one question. She didn't mind.

"Why do you buy X brand of flour?"

"Well, white flour all seems pretty much the same today, but *this* brand clearly assures you that vitamins have been added. See, it tells you plainly on the package 'ENRICHED FLOUR' and lists the vitamins. We buy enriched bread and other foods with vitamins—so I say why not get that health advantage in the flour I use?"

The lady is absolutely right, and millions agree with her. That's why "ENRICHED" is a selling word.

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For good reasons. To begin with, Pfizer has been a vitamin research and production center since the first vitamin was commercially produced. Bi-Cap® was one of the first enrichment concentrates. And this "head start" in vitamins has continued. What this means is that Pfizer can help you with the newest developments in enrichment products.

RIGHT NOW IMPROVED PFIZER BI-CAP is made with a new type of Riboflavin which gives it a *lighter color and overcomes unsightly agglomeration.* All three forms of BI-CAP are also made with Thiamine Mononitrate for better Vitamin B_1 stability.

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Victor announces the BIG

The illustration shows how southern appetites have the southern housewife baking corn bread on the average of three times a week—almost a third of her weekly baking.

G SURPRISE in corn meal

CORN BREAD IS BAKED

3 OUT OF 10 TIMES

A WEEK IN THE SOUTH

The baking of corn bread is on the rise in the South—accounting for three out of ten weekly bakings by the average southern housewife. This is the biggest surprise discovered in Victor's current survey of southern baking habits. You will want to see how often self-rising corn meal is used for this baking . . . *who* uses it . . . how you can increase its use still further.

Your Victor Representative can show you the answers and all the facts and figures. Ask him for a copy of FUTURES, the report that contains all the information about self-rising corn meal—and self-rising flour.

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Corn bread is the one baked goods that cannot be bought in a store—it has to be baked at home. Self-rising corn meal is a "natural" for this baking—and your copy of Futures can show you how to tell this story in the most appealing way. You'll find a wealth of ideas to spark your local-market advertising, merchandising, displays—the works!

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THE RISE IN SELF-RISING PRODUCTS

the following effects can be produced:

(1) Inhibition of enzyme activity, for which doses of 10 to 25 Wh or more per kilogram of foodstuffs are necessary.

(2) Sterilization—with doses of 2 to 10 Wh/kilo (with the average about 5).

(3) Pasteurization, for which doses of from less than 0.25 to 0.5 Wh/kilo are sufficient.

(4) Combating insects—doses mostly under 0.1 Wh/kilo.

(5) Inhibition of germination in vegetable products—about 0.05 Wh/kilo.

As far as all the different possibilities of treating grain and grain products with ionizing radiations are concerned, we shall deal here chiefly with those that are connected with grain processing. We shall not deal with the problems of radiation in the field of genetics, interesting in themselves though they are, since they come more under the heading of agricultural research. We have known for a long time that irradiation of seed grains can increase significantly the number of mutations of the plants, and by reducing the breeding time of new varieties with improved characteristics can increase considerably their yield and resistance to disease. It is also possible to develop new varieties that are particularly suitable for mechanical harvesting, for instance. In barley, for example, as a result of genetic changes following irradiation, a closer ear, longer straw, and a higher yield of grain and straw were achieved, while in wheat not only increased yield but also resistance to black rust were obtained. A reduction in germinating power has been obtained in wheat, potatoes and onions by irradiation.

The following possibilities in the use of ionizing radiations on grain and grain products may be worth discussing, in the light of the investigations that have been carried out:

(1) The destruction of pests in grain, flour and paste foods. This requires treatment with small doses.

(2) Pasteurization or sterilization of baked foods, requiring medium to heavy doses.

Pest Destruction

The insecticidal effect of ionizing radiations is quite remarkable. Those insects normally considered pests of stored foodstuffs can be relatively easily combated.(5) Quite small doses suffice to kill insect eggs, and even smaller doses (from 0.02 to 0.25 Wh/kilo) are enough to ensure that the reproduction of the adults is kept under. On the other hand, the more resistant flour beetle can only be killed for certain by a dose of 1.2 Wh/kilo, while the lethal dose for grain weevils is 0.6 Wh/kilo. Flour mites, however, are killed by a radiation dose of only 0.05 Wh/kilo. A similar dose applied to adult insects results in sterility, and the power of fertilized eggs to hatch out is destroyed by the use of a dose of about 0.1 Wh/kilo. As a result, insect damage to flour, grain paste foods and spices can be safely avoided.

When grain and grain products are irradiated with the insect-killing dose of 0.06 to 0.12 Wh/kilo no side effects are produced. The cost is said to be some two to five cents per hundred-pound bag in the U.S. In the latest report to the Congress of the U.S. it is reported that the total costs of controlling insects in grain by means of radiation are quite comparable with those of fumigation.

Since a dose of 0.06 Wh/kilo may generally be regarded as sufficient for the control of insects in flour, tests were carried out recently on three types of flour in order to discover the influence of the radiation dose on baking quality.(1) The flours were bread flour, all-purpose flour, and cake flour, and they were irradiated by a source of gamma rays at doses ranging from 0.05 to 2.5 Wh/kilo. It turned out that a dose of 0.05 Wh/kilo did not affect the baking quality of any of the three flours, nor the quality or taste of foods baked from them. With an increased dose, on the other hand—beginning at something over 0.1 Wh/kilo—a deterioration of the baking qualities of the flours was observed. Under otherwise normal conditions the total loaf volume decreased, for example, the crumb became more compact, heavier, and rubbery, and the crust took on a darker yellow color. When the

Advertisement

INSIDE SCIENCE

The Vital Story of Vitamin B_1

(Thiamine)

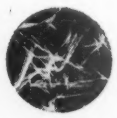
by Science Writer

History. The discovery of vitamin B_1 resulted from research into the cause of beriberi. Almost 50 years passed between Eijkman's discovery of the relationship of the disease to diet and the famous work of Jansen and Donath who first isolated the crystalline vitamin from rice bran.

Within ten years of that first isolation the vitamin's chemical structure was determined and it was successfully synthesized.

Eijkman's work resulted in the development of a theory that beriberi was caused by a lack of some factor in the diet and not by a toxin or infectious agent. This idea was not readily accepted until the growth of dietary knowledge proved it correct.

Isolation and Synthesis. In 1926 Profs. Jansen and Donath accomplished the isolation of crystalline vitamin B_1 from rice bran. In 1931 Windaus and co-workers successfully isolated pure vitamin B_1 and established its empirical formula. In 1936 R. R. Williams, and independently R. Grewe, explained the vitamin's chemical structure. That year, R. R. Williams and J. K. Cline accomplished the synthesis of thiamine which is in wide use today. Andersag and Westphal also synthesized the vitamin in 1936. Another synthesis was described by Bergel and Todd in 1937.



Photomicrograph of B_1 crystals

Chemical and Physical Properties. Thiamine hydrochloride is white, water soluble, with a nut-like, salty taste and yeast-like odor. Its empirical formula is: $C_{12}H_{17}ClN_4OS \cdot HCl$. Thiamine produced by synthesis is identical chemically and in biological activity with that obtained in pure form from nature.

Deficiencies. A deficiency of thiamine is characterized by these symptoms: depression, irritability, fearfulness, lack of initiative and interest, loss of appetite. Symptoms vary since in usual practice deficiencies of other water-soluble vitamins occur. Medical treatment is simple: a sufficient amount of thiamine is administered to relieve symptoms quickly and the physician provides for a continuing adequate intake.

Beriberi victim

A severe deficiency of thiamine leads to beriberi, a serious and sometimes fatal disease. While beriberi is almost a medical curiosity in the United States, it is common in countries in which polished white rice is a staple of the diet.

Human Nutrition Requirements. Thiamine is one of the nutritive elements the human body needs daily and does not store in quantity. The minimum daily requirements established by the U. S. Food and Drug Administration for the prevention of symptoms of thiamine deficiency disease are:

Adults	1.00 mg.	Children (1-5 incl.)	0.50 mg.
Infants	0.25 mg.	Children (6-11 incl.)	0.75 mg.

The Food and Nutrition Board of the National Research Council recommends the following dietary intake of thiamine for healthy persons in the U. S. A.

Recommended Daily Intake in Milligrams

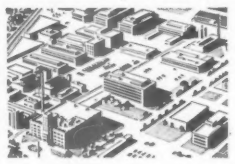
Age	*Men*	*Women*
25	1.6	1.2
45	1.5	1.1
65	1.3	1.0
Pregnant (3rd trimester)		1.5
Lactating		1.5

The Council recommendations for infants and children vary below and above these figures, based on age and sex. Various illnesses and stress situations can exhaust vital reserves of thiamine. So, for the physician, vitamin B_1 is prepared in various dosage forms and potencies for therapeutic and prophylatic use.

How do human beings receive thiamine? It is widely distributed in foods of animal and vegetable origin, particularly cereal grains and dry legumes. Because of public demand for refined products which millers must meet for obvious economic reasons, a loss of thiamine and other factors occurs during processing. The thiamine loss is overcome through the use of *enrichment* in cereal grain products for which Federal Standards exist, or in other foods such as breakfast cereals, by *fortification* or *restoration*. When enriching, fortifying or restoring, the food processor adds the necessary amount of pure thiamine (and other vitamins and minerals) to the food so that the finished product meets Federal, state and territorial requirements or contributes to the consumer an amount of the vitamin which dietary experts believe significantly useful.

Thiamine is extensively used for the enrichment of cereal grain foods such as white flour, white bread and rolls, macaroni products, farina, corn grits and meal, milled white rice. The story of these uses is delightfully told in a separate brochure which is available on request for reference or educational purposes.

Production. Huge production facilities at the Hoffmann-La Roche plant in Nutley, New Jersey, deliver highest quality thiamine *by the tons*. Roche manufactures thiamine hydrochloride and thiamine mononitrate. These fine products, which equal or exceed U.S.P. specifications, are ideal for use by pharmaceutical makers and food processors. Years of experience in research and manufacture have made Roche the leader in vitamins.



This article is published in the interests of pharmaceutical manufacturers, and of food processors who make their good foods better with essential, health-giving vitamin B_1. Reprints of this and others in the series are available on request. Write the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

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dough was prepared the drier, starchy structure of the flour was noticed. The cause was traced back to damage to the gluten. Alterations in taste were observed in the products baked from flours that had been irradiated at a dose of 0.25 Wh/kilo and over.(1) In particular, the crust tasted at first sweeter, but at higher doses an increasingly foreign flavor made itself apparent. To make a good sponge cake dough from irradiated flour 10% more milk had to be added because of its "dryness" and the foreign flavor was evident in the sponge at doses of 0.05 Wh/kilo and over.

When bread was baked from flour irradiated at low doses (0.05 Wh/kilo) only a somewhat smaller volume was noticed. At doses of about 1.0 to 2.5 Wh/kilo a noticeable reduction in volume was observed, and the crust took on the color of malt bread.

The Americans have projected and worked out plans for various embodiments of an irradiating machine for treating grain or flour with ionizing rays. American authors,(1) on the basis of their experiments and calculations, have come to the conclusion that irradiation of flour or grain, in order to control insects, both from an economic point of view and from the viewpoint of baking quality, is an entirely practical proposition.

Pasteurization

Bread ready-packed in synthetic foil—e.g. sliced bread like pumpernickel—could be pasteurized or sterilized, according to the dose used. For these purposes doses of from 0.25 to 5.0 Wh/kilo are necessary. In this range of dosages we must reckon with the side effects of the radiation that can make the bread suspect from the point of view of health and can affect its taste. Because of the high doses, too, the costs of irradiation have to be watched with care. At a dose of 0.25 Wh/kilo they may be in the neighborhood of 2¢ a kilo of bread and at 5.0 Wh/kilo they may rise to over 4¢ a kilo. Tests carried out in the U.S. with slices of white bread closely wrapped in polyethylene bags showed that with a radiation dose of 1.2 Wh/kilo, at which no deterioration in flavor occurred, the bread could be kept in good condition at room temperature for two months, while untreated control samples went moldy.

Numerous experiments have been carried out on animals—especially in the U.S.—to find the answer to the question of how far irradiation gives rise to products that are injurious to health. In them, individual foodstuffs as well as carefully formulated diets have been tested. The general conclusions were that in rats fed on irradiated foodstuffs, among them wheat and bread, there was often a slight reduction in the rate of growth, in the rate of conversion of food, in reproductive activity, and in the final weight reached.(3) How far part of this effect can be attributed to the heavy destruction of vitamin E brought about by irradiation is not yet satisfactorily clear. It is certain, however, that no carcinogenic effects of any sort were found. More recently further results of tests were published which touch particularly on the subject in which we are interested. The first concerns a total of three generations of rats which were observed over a period of several years. Their diet—consisting of five sixths whole wheat meal and one sixth whole milk powder—was irradiated with a gamma ray (cobalt 60) dose of about 4.0 Wh/kilo.(2) As far as growth was concerned, there was a barely noticeable difference in favor of the control group, while the reproduction factor of the control group was significantly better. In no case was any carcinogenic effect from the irradiated foodstuffs established.

In the framework of a bigger test recently, rats were fed with, among other things, bread that had been irradiated at doses of 7.0 and 14.0 Wh/kilo. The results of this test were completely satisfactory. There were no signs of any toxicity induced in white bread by irradiation. In spite of these and numerous other similar results, however, we cannot consider suspicion of the reliability of the irradiated products completely relieved. The experiments on human nutrition begun in the U.S. about a year ago(3) are therefore of the greatest interest, and the results are eagerly awaited. They have so far shown no deleterious effects, but they are to be prolonged for a total of five years.

Radiation Effects

Under the heading of effects produced in grain and grain products like bread by radiation, we are interested in all possible reactions, particularly those that affect carbohydrates, proteins, fats and vitamins. In general, the carbohydrates reveal themselves as quite stable up to high dosages, with certain exceptions, such as alterations in aroma and color that must be taken into account. Tests on glucose solutions, for instance, showed that when they are irradiated glucic acid is formed as a product of oxydation. The presence of oxygen naturally favors this reaction. Cellulose at high dosages produces CO_2, H_2O, and acids, and loses its fibrillary structure: at very high dosages of 25 Wh/kilo depolymerization, associated with the formation of fragments of very low molecular weight (among them reducing sugars) was observed. Native proteins show themselves generally resistant to radiation. Amino acids remain intact only at low dosages. At

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doses as low as 0.5 Wh/kilo deamination to histidine, cystine, phenylalanine, tyrosine, and tryptophane was observed.

In fats, the basic possibility is that of the dissolution of carbohydrates with their consequent reformation from the resulting fragments, the formation of peroxides—possibly with a delayed effect on the hydrogen ion count(6)—and decarboxylization (observed in fatty acids). The effects are extremely complex, so much the more since water and oxygen are practically always present. We can however, generally affirm that fats and oils tend to develop a rancid flavor. Of the vitamins, the easily oxidized ones are attacked first. It is possible, however, to show that the retention of vitamins under radiation in solutions and in foodstuffs can be quite different—as a rule vitamin losses in foodstuffs are smaller than those in solutions (protection effects and secondary effects).(6) The resistance to radiation is mostly in direct proportion to the reistance to oxygen and/or heat. Thus, among others Vitamin A, carotene, tocopherol (Vitamin E) and Vitamin C are partially destroyed and—as far as the results available show — thiamine, nicotinamide, and riboflavin are destroyed to a lesser extent. Antioxydants are used up or destroyed as a result of radiation. Enzyme systems are extremely resistant, and at the doses normally used for grain are not attacked at all.

Economics

The question of the extent to which the technical use of ionizing rays on an industrial scale is possible today can be positively answered, because there are several machines available that can carry out sterilization on a large scale. We find on the market electron accelerators with a radiation capacity of several kilowatts. If we reckon that for grain a radiation dose of 0.05 Wh/kilo is needed, for example, and accept that only one half of the radiations generated are usable for sterilization, then we shall require a radiation capacity of 0.1 Wh per kilogram of grain. Every kilowatt of radiation capacity, therefore, can be used to irradiate 10 tons of grain an hour.

For the possibility of using ionizing rays in practice, however, the economics of the process are of very great importance. As sources of radiation both radioactive substances such as isotopes and electrically powered apparatus can be used.

Satisfactory electron accelerators for high capacities may be purchased at reasonable prices, and their maintenance is simpler than that of radioactive substances since the rays are concentrated and directed, and their production can be stopped by switching off the electric current. If we figure on a price of $130,000 for the building, installation and shielding of an industrial plant producing electron radiations of three kilowatts at an energy of three million electron volts, then we get a total operating cost of $4.20 per kilowatt/hour for American conditions under given circumstances (two-shift working, etc.). The plant would deal with 30 tons of grain an hour at a cost of about 1¢ per hundredweight of grain irradiated. More recent American calculations give figures for irradiation costs, according to the type and size of the plant, as low as 75¢ ton.

Present-day costs of irradiating by means of radioactive substances are higher, though it is hoped that in time cheaper by-products, which will

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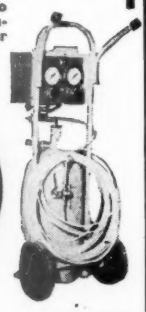

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be ideal for the purpose, will become available from the atomic reactors. The use of gamma rays, with their high penetrating power, could be of great economic interest if the price of the radioactive preparations were reasonable. Even when the present technical and scientific obstacles in the way of their use have been cleared, however, it is unlikely that radioactive isotopes will be used on a large scale for industrial purposes. According to present estimates, the isotopes in the quantities required will not be available for several years. Practical information about the costs of irradiating other foodstuffs with ionizing radiations is not yet available.

Conclusions

In conclusion, we may say that—as far as we can tell today—the use of ionizing radiations in the field of grain processing for insect control in grain, flour, and paste foods, as well as for the pasteurization of sliced bread and wafers, is quite practicable. Certainly the question of the harmlessness of the use of radiations on foodstuffs has not yet been entirely satisfactorily answered. Nevertheless, we have seen particularly good possibilities already in those cases where small doses can be used with sufficient effect. A fully developed process of practical value for general use is not yet available, though the developments up to the present in this field, which have taken place very largely in the U.S., should give us confidence enough to follow events with very keen interest and to entertain thoughts of their possible use in our own industry.

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—BREAD IS THE STAFF OF LIFE—

3 Changes on Colorado Mill & Elevator Staff

DENVER—L. C. Robinson, general superintendent of the Colorado Mill & Elevator Co., Denver, has announced three changes in the flour milling division of the company.

John Wingfield, formerly plant superintendent of the Beardstown (Ill.) Mills, has been named divisional superintendent, with headquarters at Denver. Samuel Lowe, Jr., formerly assistant at Omaha, has been appointed plant superintendent at Beardstown.

Glenn Gabbert, former divisional superintendent, has resigned to take a position with the Terminal Flour Mills Co., Portland.

Feed Mills Installing New Equipment

Many feed mills have been installing new machinery to improve their efficiency and service to feeders. This trend, prevailing in all parts of the country, is evident in a report from the Prater Pulverizer Co.

The report tells of recent installations of new grinding, mixing and other equipment in 17 mills in 11 states in different parts of the country. The states are Michigan, Iowa, Indiana, Mississippi, Kansas, Wisconsin, Montana, Nebraska, Ohio, Minnesota and Washington.

Also reported were Wenger molasses mixer installations in seven mills in Indiana, Wisconsin and Michigan.

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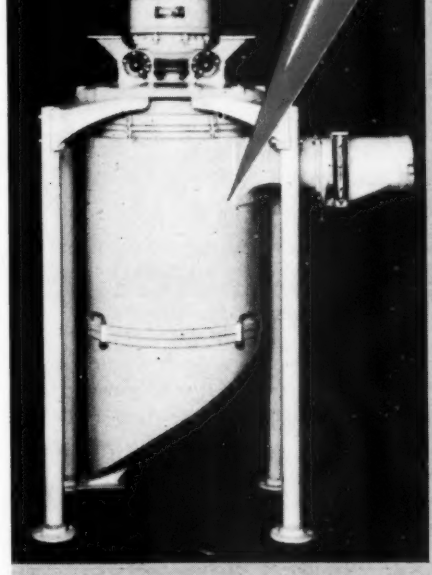

Again, in 1956, more mills modernized their grain cleaning system by incorporating the ENTOLETER SCOURER-ASPIRATOR in their cleaning house flows!

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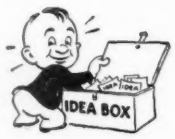

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No. 5626—Bulk Weigher

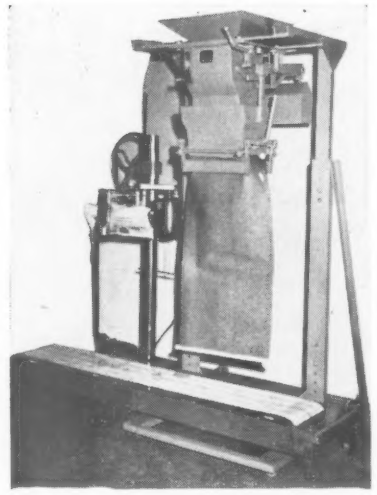
Remotely printed and totaled net weight records of bulk material are provided by a bulk weigher being marketed by the Toledo Scale Co. The unit has a capacity of 50,000 lb. per hour with the individual drafts of material weighing 1,000 lb. each. However, it is reported that capacities range up to 2,000,000 lb. per hour to meet individual requirements. The results claimed for this unit are (1) automatic weighings, (2) automatic subtractions of any material remaining in hopper, (3) automatic listing and totalling of net weights, (4) remote location of adding machine and operating controls. Secure more details by checking No. 5626 on the coupon and mailing it to this publication.

No. 5617—Filling Hopper and Stand

The Burrows Equipment Co. announces a new addition to its line of grain testing equipment. A new model filling hopper and stand is designed for use in filling test cups in making weight-per-bushel tests. This equipment is designed to conform with the U.S. Department of Agriculture specifications, company officials state. The brass funnel is attached to a steel upright which is securely fastened to a solid metal base. The unit is so arranged that the test cup is placed beneath the hopper with an exact spacing of 2 in. Excess grain is allowed to flow over the top of the test cup into the sample pan beneath. After the weight-per-bushel cup is filled, it can be attached to the beam and be hung from the hook which will pivot out to the side of the unit. For further information, check No. 5617 on the coupon and mail it to this publication.

No. 5595—Scale-Sewing Machine

The Burrows Equipment Co. announces a new combination bagging scale and sewing machine. The Apex bagging scale combines weighing and filling in one semi-automatic operation. The scale will weigh grain, feed, seed, chemicals and most types of free flowing material at the rate of six to ten bags per minute, it is claimed. The unit is available with either fixed style bag clamp, or adjustable clamp to handle bags from 25 lb. to 200 lb. The scale is mounted on a steel frame which is adjustable for different height bags. The frame is mounted on casters. It is independent of the sewing machine and conveyor. The sewing machine with conveyor belt will sew paper, cloth and burlap bags. The sewing head is adjustable to any size bag up to 40 to 48 in. The conveyor is



6 ft. long, powered with a heavy duty gear head motor and chain reduction operated by foot pedal control.

No. 6512—Paper Brochure

The Olin Mathieson Chemical Corp., forest products division, has prepared a brochure explaining how Kraft paper is made. The division produces multiwall bags and other paper bags and container products. The brochure provides company informa-

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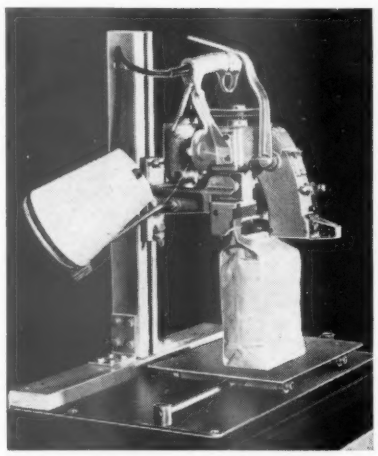
tion and lists principal products, including its agricultural chemicals. Secure the brochure by checking No. 6512 on the coupon and mailing it to Croplife.

No. 6507—Freight Car Apron

The Lite Line Industries division, Copperloy Corp., has announced the development of a new flat apron. Designed to use as bridging between flat cars in truck-rail piggy back service, the aprons can also be used for other applications where bridging is necessary for the movement of heavily loaded vehicles. The aprons are used in pairs. Each weighs less than 100 lb. and measures 30 by 56 in. Other special sizes are also available. Check No. 6507 on the coupon and mail it to Croplife to receive more complete details.

No. 5618—Carriage Conveyor

A new table model carriage conveyor, model FS, for closing of small bags with the Fischbein portable bag closer, has just been introduced by the Dave Fischbein Co. The bag closer is locked into proper position on the carriage conveyor unit by turning a knob. The machine can be instantly removed at any time for use elsewhere. The operator guides



the bag through the sewing operation which is controlled by a foot switch. The carriage glides on ball bearing rollers and returns automatically to the starting position, ready for the next bag. Adjustable for varying size bags, the conveyor accommodates the 2½ lb. cone of thread or the 4 oz. cone. Secure more complete details by checking No. 5618 on the coupon and mailing it to this publication.

—BREAD IS THE STAFF OF LIFE—

CONTRACT AWARDED

OTTAWA, KANSAS—The contract for construction of the new Ottawa Cooperative elevator has been awarded to Chalmers & Borton, Hutchinson, Kansas, whose bid for the project totaled $131,900.

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Hungarians Discover Threefold Parasitism In Wheat Stem Rust

Two Hungarian researchers have put forward tentatively an explanation for the sudden changes in the nature of epidemics of wheat rust.

They have discovered that the rust is attacked by a bacterial parasite and the bacterium, in turn, is being attacked occasionally by a new species of virus. This threefold parasitism of wheat is said to be unique in the plant kingdom.

The researchers, who are on the staff of the Plant Protection Institute of Sciences, are publishing their results in Nature, the British science journal.

Their line of inquiry began with the announcement in the U.S. two years ago that certain kinds of rusts were being attacked by a bacterium to which the name of Xanthomonas was given. The Hungarians found the bacteria on their own experimental cultures of wheat rust. They also found a third disease, a virus or organism too small to be seen through a microscope, was preying on the bacteria. It has been isolated, but it has not yet been named.

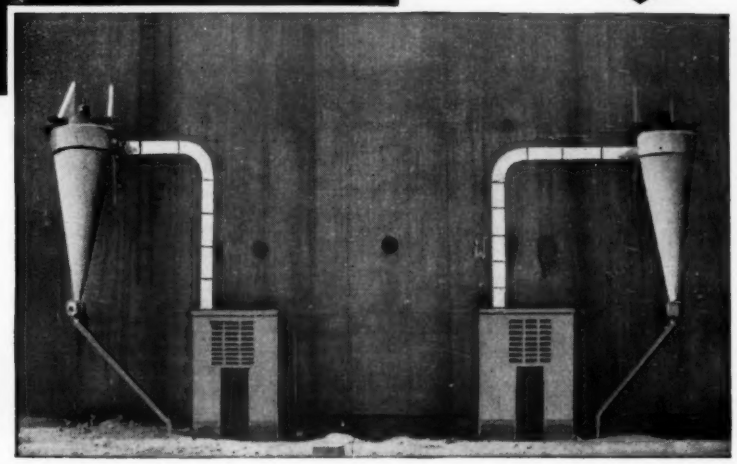
No Wheat Seized In S.D. Because Of Rodent Filth

South Dakota has not had a single carload of wheat seized as being unfit for human use because of rodent and insect filth during the last six months.

This fact was revealed by John Lofgren, extension entomologist at South Dakota State College and secretary of the South Dakota Clean Grain Committee. In a recent meet-

HOW TO CONTROL DUST THE NEW, LOW-COST WAY

One of the World's Largest Grain Elevators—C-G Grain Co. 20-million bushel house near Wichita, Kansas—equipped with the Forster "FORNADO" Dust Control twin installation pictured below. A 450-foot dust-free tunnel.



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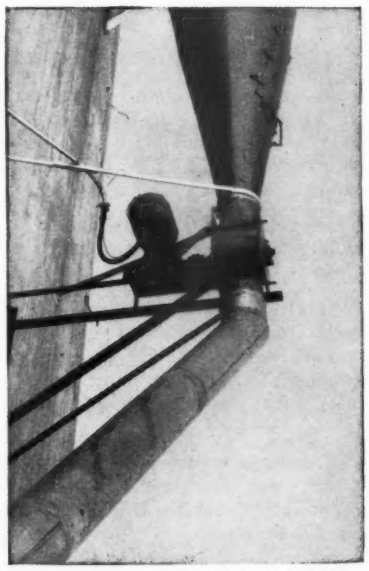

The Forster AIR-LOCK IS ONE reason for high efficiency of the Forster "FORNADO" dust system. Installation pictured above returns recovered material from receiving unit to stock, still keeping a positive air seal on this highly efficient dust control system.

AT LAST! Here's a dust control system that is simple and efficient with all operating savings from modern engineering and design. It is the new Forster FORNADO, an integrated pneumatic system that fits both large and small plants.

When you see it, you will recognize at once that FORNADO is miles ahead of the field because it is so compact. The unit consists of a skillfully designed collector, a high static precision fan connected directly to the motor and an efficient airlock.

The secret of its success is the carefully balanced capacities of each part of the unit. And the secret of its lower cost is simple installation, big power savings and easy maintenance. FORNADO has been tested and proved in installations like that in the big C-G grain elevator pictured above.

It's easy to modernize your present system and get the extra efficiency and low operating costs of top-rated FORNADO. Let Forster engineers analyze your problem without cost to you.

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Machines for Modern Milling

ing the group discussed plans for promoting grain cleanliness and re-elected the same officers for 1957. They include O. G. Claflin, president, and Clifton Anderson, vice president, both of Aberdeen. Mr. Lofgren will continue as secretary.

Mr. Lofgren explained that prior to July 1, and under the old regulation which allowed two rodent pellets a pint, three cars of South Dakota wheat had been seized. The Pure Food & Drug Administration tightened restrictions and a maximum of only one rodent pellet per pint sample was allowed.

"The seizure situation has improved all across the nation," says Mr. Lofgren. He compared a three-month period (July to October) during 1955 under old regulation with the same period in 1956. In 1955, 264 carloads were checked and two cars were seized because they did not meet minimum requirements for insect and rodent sanitation. In 1956, 718 cars were inspected and 11 cars were seized. Had the old tolerance still been in effect only two would have been contaminated even though more than two and a half times as many cars were checked as in 1955.

Mr. Lofgren pointed out, however, that these figures also indicate there is more work to be done to reduce rodent contamination. On a percentage basis the national seizure is higher than it was in 1955 because of tightened tolerances.

—BREAD IS THE STAFF OF LIFE—

SHIPS FOR WHEAT

WASHINGTON — The Maritime Commission program to release "mothballed" ships for exporting agricultural commodities is now in full swing. Through Jan. 24, 70 bulk-cargo, 44 berth, and 95 coal ships (which will release other ships for wheat) were authorized for release to foreign trade.

Chemists Hear Talk On Food Research For Armed Forces

Progress and development in supplying food to the armed forces were traced at the January meeting of the New York Section of the American Association of Cereal Chemists by Charles S. McWilliams, chief of the Cereal and Baked Products Section of the Quartermaster Food and Container Institute.

Mr. McWilliams described mass feeding methods used by the army from the Civil War through World War II with the use of slides. He pointed out that considerable improvement has been made not only in sanitary conditions under which foodstuffs are supplied and prepared for military units, but also in variety and quality, such as the inclusion of canned bread and cake in the military ration.

Special rations, such as Arctic Trail and In-Flight rations, were also described by Mr. McWilliams. New problems have been introduced with the use of high altitude aircraft which require their crew members to wear oxygen masks. Current research is with liquid foods which can be consumed by the pilot and other members of the crew while in high altitude flight.

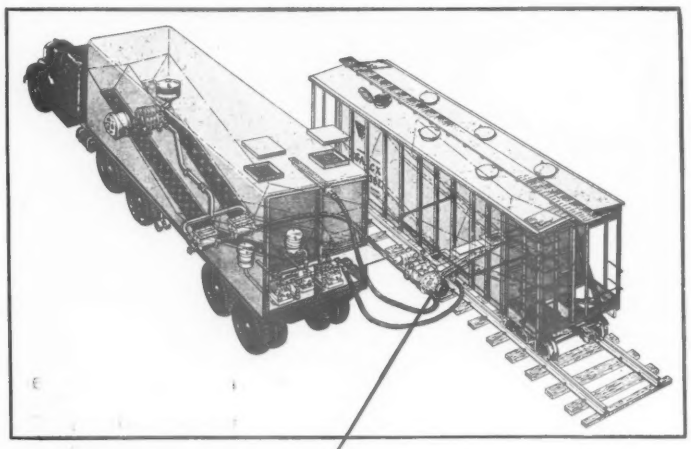
Principal areas in which further research is being conducted, Mr. McWilliams said, are the radiation of foods, freezing and dehydrating meat and fish products and pre-cooking and dehydrating combined foods like chicken and rice, chile con carne, etc. Varied forms of packaging material, such as polyethylene-foil laminate, are also under study. Mr. McWilliams also reported some progress has been made in the production of prepared mixes, including an instant bread mix which uses a chemical leavening agent or enzymatic action.

—BREAD IS THE STAFF OF LIFE—

Alvey Conveyor Co. Announces Promotions

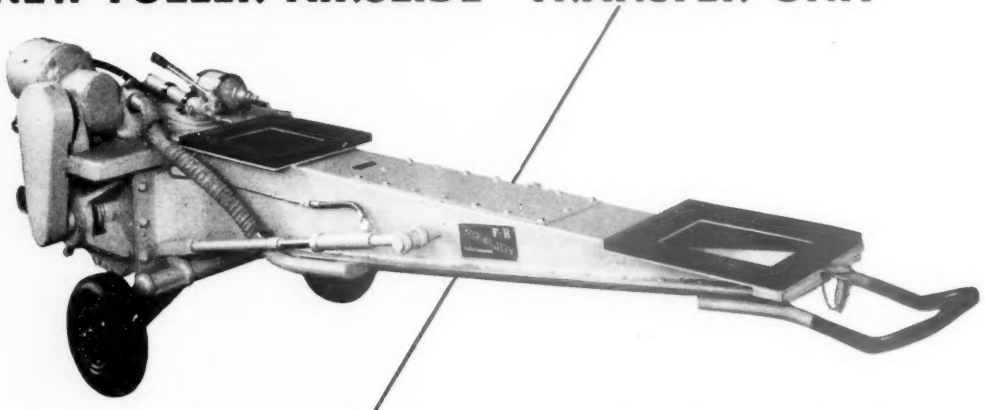
ST. LOUIS—Promotions and staff changes at the Alvey Conveyor Manufacturing Co., St. Louis, have been announced by J. M. Alvey, president. They included the following:

Peter Horn to vice president in charge of engineering, John M. Alvey, Jr., to assistant to president, Walter G. Brand to chief engineer, Ernest E. Roth in charge of research and development, Raymond W. Kabuss in charge of cost department, Walter H. Oswald to advertising manager and assistant sales manager, succeeding Clarence H. Adamson, who recently retired.

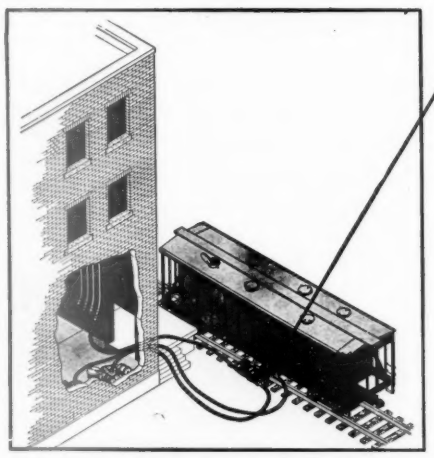


Transferring flour from Airslide car to Airslide bulk flour van.

THE NEW FULLER AIRSLIDE® TRANSFER UNIT



Puts bulk flour in reach of EVERY baker



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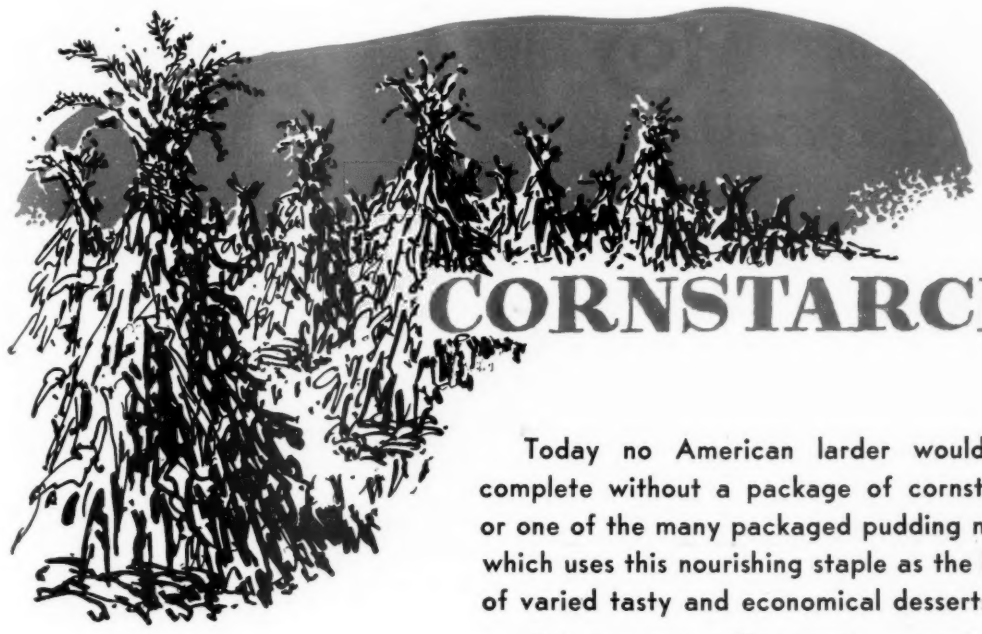

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